



Riparian Raptors on USACE Projects: Peregrine Falcon (*Falco peregrinus*)

The peregrine falcon (Figure 1) is one of four raptor species included in a series of Engineer Research and Development Center (ERDC) technical notes produced under the Ecosystem Management and Restoration Research Program (EMRRP). These technical notes (ERDC TN-EMRRP-SI-12-15)) identify riparian species potentially impacted by U.S. Army Corps of Engineers (Corps) reservoir operations. For management purposes, these raptors are considered riparian generalists because they inhabit riparian zones surrounding streams and lakes on Corps project lands but may seasonally use adjacent transitional and upland habitats. The other raptors in this grouping are the bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), and red-shouldered hawk (*Buteo lineatus*), each of which is discussed in a separate technical note describing the ecology, legal status, potential impacts, and management guidelines for the species. These technical notes are products of the EMRRP work unit entitled "Reservoir Operations - Impacts on Habitats of Target Species" and are linked to ERDC TN-EMRRP-SI-11, which describes the function of the work unit and the general status, impacts, recovery, and management of these four riparian raptors on Corps projects.



Figure 1. Peregrine Falcon
(Photo by Greg Gothard)

DISTRIBUTION: Three subspecies of peregrine falcons recognized in North America are the American (*F. p. anatum*), arctic (*F. p. tundrius*), and Peale's (*F. p. pealei*) (U.S. Fish and Wildlife Service (USFWS) 1987). The American peregrine falcon is the most common subspecies in the United States. It nests from central Alaska to north-central Canada, south to central Arizona and Baja, California, and winters within its breeding range (Figure 2). The arctic peregrine falcon breeds in the tundra region of North America and Greenland and winters south to Central America, Chile, and Argentina with major stopover sites along the Texas Gulf Coast and eastern shore of Maryland (White 1968). Peale's peregrine falcon is a sedentary, nonmigratory race that occurs along the Aleutian and Queen Charlotte Islands near southeast Alaska.

STATUS: In North America the peregrine falcon had been eliminated throughout most of its historic breeding range by the mid-1950s (Johnsgard 1990) and had been extirpated as a breeding species in the eastern United States by the mid-1960s (USFWS 1979). In 1970 endangered status was granted to the arctic and American subspecies under the Endangered Species Conservation Act of 1969, predecessor of the current law (Hoffman 1998) (Peale's peregrine was never listed as endangered). Following intensive recovery efforts by the USFWS and peregrine falcon organizations (e.g., The Peregrine Fund), the arctic peregrine was removed from the federal list in 1994. By 1998 approximately 1,600 pairs of peregrines were nesting in Canada and the United States, numbers well above the recovery goal of 631 pairs. Therefore, the American peregrine was considered

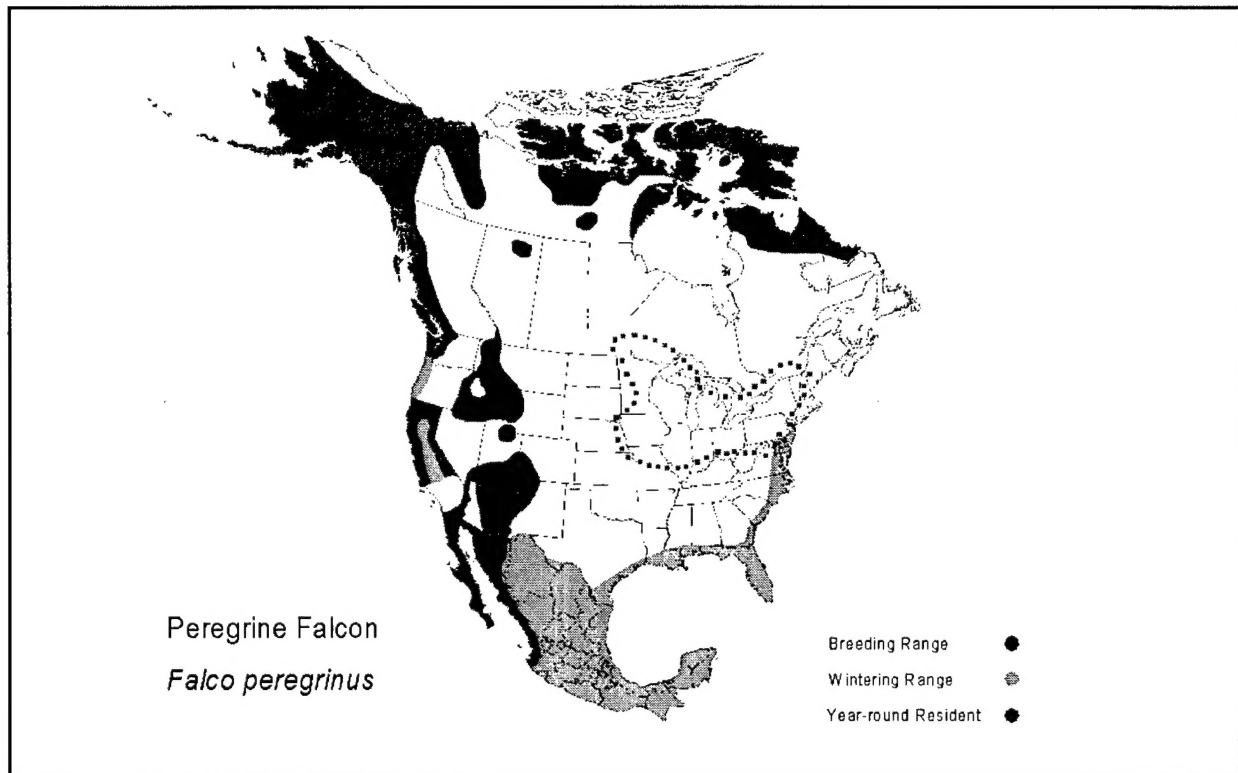


Figure 2. Range of the peregrine falcon in North America and Mexico

sufficiently recovered and was delisted in 1999 (The Peregrine Fund 1999). The peregrine receives protection under the Migratory Bird Treaty Act, the Migratory Bird Conservation Act, the Lacey Act, and the Convention on International Trade in Endangered Species of Wild Flora and Fauna. In many states the peregrine falcon is still considered endangered or threatened (Table 1).

HABITAT: Peregrines are found in a wide variety of habitats throughout North America, including plains, tundra, forests, coastal regions, and mountains up to 10,000 ft (3,048 m) (Johnsgard 1990). The most important components of peregrine habitat are high, steep cliffs with an abundance of protected ledges for nesting and open undisturbed areas for hunting. Foraging habitat includes grasslands, meadows, and other open areas (The Nature Conservancy (TNC) 1992). The densest populations are found in areas where lakes or streams provide flight corridors between nesting and hunting sites (Beebe 1974). Pairs usually form long linear associations along these corridors, with nests spaced about 0.6 mile (1.0 km) apart. Because peregrine falcons use such diverse habitats, the process of hacking has been effective in establishing nesting peregrines in geographic areas otherwise vacant, thereby expanding the breeding range (Walton and Thelander 1988). Through hacking programs, peregrines have also found nesting habitat in cities with skyscrapers, which simulate high cliffs.

BEHAVIOR: Peregrine falcons maintain a home range of 6.5 to 15.5 square miles (17 to 40.5 km²), depending upon the subspecies and geographical location (Brown and Amadon 1968; Court, Gates, and Boag 1988). Although northern populations of the American peregrine winter within the breeding range, young birds will often disperse several hundred miles from their natal range (TNC 1992). Peregrines begin breeding at 2 to 3 years of age (Craig 1986) and usually form

permanent, life-long pair bonds (Johnsgard 1990). Breeding behavior begins approximately 2 weeks prior to egg laying and involves a characteristic set of displays and vocalizations. Aerial displays, courtship feeding, food transfer, and posture displays occur before copulation, which takes place at a nest site selected by the female (Ratcliffe 1980). A pair of courting peregrines defends its nest against conspecifics, but the male provides most of the defense during brooding.

REPRODUCTION: Southern populations begin nesting in mid-March, and eggs are laid in early April; however, northern populations usually breed later with eggs not being laid until late April (World Wildlife Fund 1992). Eggs are laid at 2- to 3-day intervals in shallow depressions or scrapes placed in loose gravel or soil (Johnsgard 1990). Clutch size ranges from 3 to 7 eggs per nest, usually 3 or 4, and incubation varies between 28 and 33 days (Ratcliffe 1980). Renesting may occur if the first clutch is destroyed early in the incubation period. Young birds fledge in 33 to 45 days but remain dependent on parents until the following fall (Cramp and Simmons 1980). Annual reproductive success is approximately 2.5 young per nest (Craig 1986), but juvenile mortality is high during dispersal, ranging from 20 to 90 percent (Parnell 1977).

FOOD HABITS: The peregrine hunts over areas that cover up to 20 square miles (52 km²) and kills upon impact by diving at its prey at speeds approaching 200 mph (322 km/hr) (Sylva 1998). Hunting strategies are divided into three categories; still-hunting, aerial hunting, and aerial flushing (Czechura 1984). Still-hunting peregrines wait on perches to attack passing prey in the air. In aerial hunting, birds maneuver over prey and attack in a high-speed stoop, killing prey in mid-air or driving it to the ground. Aerial flushing is conducted by a single bird circling overhead until the prey (usually a ground-dwelling bird) is flushed and then attacked by the latter method. More than 100 prey species (primarily birds) are taken by peregrine falcons (Brown 1976). Game birds, shorebirds, pigeons and doves, and medium-sized passerines constitute the majority of prey items. Types of prey most often utilized are highly mobile, flocking, colonial-nesting shorebirds and waterfowl (Beebe 1974). Peregrines in urban settings feed primarily on starlings (*Sturnus vulgaris*) and rock doves (*Columba livia*) (USFWS 1988). Weights of prey species range from 3.5 to 17.5 oz (99 to 500 gm), but birds as large as geese are occasionally taken. Timing of breeding coincides with seasonal prey availability, and prey populations peak when peregrine food requirements are highest (Sylva 1988). The male provides most of the food during brooding.

IMPACTS: The major factor contributing to the decline of the peregrine falcon was the widespread use of chlorinated hydrocarbon pesticides and herbicides, such as DDT and DDE, after World War II (USFWS 1988). These organochlorines accumulated in tissues of prey items ingested by peregrines and resulted in decreased reproduction through eggshell thinning and breakage and behavioral problems such as delayed breeding (Zarn 1974). With the banning of DDT in 1972, peregrine populations began to recover from the effects of organochlorine pesticides, which no longer threaten populations in most of North America. However, concern exists for migrant birds of the southwestern United States and Mexico, where DDT is used for malaria control and may still be applied to agricultural fields in major areas of bird use (Mora 1997). Other threats to peregrine populations have included disease, loss of wetland habitats which support the major prey species, and indiscriminate killing by farmers, ranchers, and hunters (USFWS 1996). Peregrines are prized by falconers, and the removal of young and eggs from nest sites represented a threat before passage of the Endangered Species Act in 1973 and establishment of captive breeding programs (TNC 1992). Peregrines are fairly tolerant of human activity below their eyries, but the high interest in

rock-climbing presents a potential threat, as continual human disturbance can result in nest abandonment.

MANAGEMENT: Protection from killing and nest site destruction was essential to recovery of the peregrine falcon in the 1970s and 1980s. Providing nest sites and hacking young birds into the wild were particularly effective in helping to reestablish populations, as those birds are now returning to breed in areas where they were fledged or released. Although juveniles are still being hacked to introduce peregrines to new areas, current practices tend to focus on other aspects of management. A management program should initially determine the abundance, distribution, and status of the species. Specific tasks for peregrine management include: (1) identifying and preserving nesting and foraging habitats; (2) conducting annual surveys during migration and the breeding season to determine if potential habitat is being used by transient or resident individuals; (3) maintaining small, interspersed openings (especially wetlands) to provide hunting areas; (4) controlling development in and around potential habitat; and (5) maintaining viable wetlands to support prey species within 15 miles (24 km) of active nests. Observation data and location of eyries (active or inactive) should be permanently cataloged and used to locate and monitor areas consistently used by peregrines. Suitable nesting and foraging sites should be protected from physical alterations (e.g., road construction, urban development, mining), and human activity should be limited in these areas, especially during the early stages of nesting. USFWS guidelines for the protection of nesting peregrines suggest that activity within 1 mile (1.6 km) of active nests be restricted from 15 April through 31 August (nesting season) (USFWS 1982). Land-use practices that result in sudden landscape changes (habitat loss) on and around hunting areas can be detrimental to peregrines. Development (i.e., clearing, burning, draining) in areas used for hunting sites should be phased and completed over a period of time.

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Table 1
Peregrine Falcon (*Falco peregrinus*) State Protection Status

State	Status	State	Status
Alabama	SP	Montana	SE
Alaska	SSC	Nebraska	SE
Arizona		Nevada	SP
Arkansas		New Hampshire	SE
California	SE	New Jersey	SE
Colorado	SSC	New Mexico	SE
Connecticut	SE	New York	SE
Delaware	SSC	North Carolina	SE
Florida	SE	North Dakota	SE
Georgia	SE	Ohio	SE
Hawaii		Oklahoma	SE
Idaho	SE	Oregon	SE
Illinois	SE	Pennsylvania	SE
Indiana	SE	Rhode Island	
Iowa	SE	South Carolina	SE
Kansas	SE	South Dakota	SE
Kentucky	SE	Tennessee	SE
Louisiana	SE	Texas	SE
Maine	SE ¹	Utah	SE
Maryland	SE	Vermont	SE
Massachusetts	SE	Virginia	SE
Michigan	SE	Washington	SE
Minnesota	ST	West Virginia	SSC
Mississippi	SE	Wisconsin	SE
Missouri	SE	Wyoming	SSC

¹ Breeding population only.

FE= Federally endangered species

FT= Federally threatened species

SE= State endangered species

ST= State threatened species

SP= State protected

SSC= State species of special concern

WL= State watch list species (no state protection)